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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/691,784	10/18/2000	In Sool Chung	0939H-071110US	3696

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TOWNSEND AND TOWNSEND AND CREW, LLP
TWO EMBARCADERO CENTER
EIGHTH FLOOR
SAN FRANCISCO, CA 94111-3834

EXAMINER	
SEFER, AHMED N	
ART UNIT	**PAPER NUMBER**
2826	

DATE MAILED: 03/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/691,784	CHUNG ET AL.	
	Examiner	Art Unit	
	A. Sefer	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 November 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6 and 15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,6 and 15* is/are rejected.

7)☒ Claim(s) *4 and 5* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Amendment

1. The amendment filed on November 13, 2003 has been entered; no new claims have been added.

Response to Arguments

2. Applicant's arguments with respect to claims 1 and 2 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sawada et al. ("Sawada") USPN 6,184,516 in view of Rhodes US PG-Pub 2003/0169360.

Sawada discloses in figs. 1-6 an image sensor comprising a semiconductor substrate 10 of a first conductivity type; a peripheral circuit 21 formed on a first region of the semiconductor substrate, wherein a ground voltage level GND is applied to the first region; a unit pixel array 20 having a plurality of unit pixels formed on a second region of the semiconductor substrate; and wherein the first region is isolated from the second region, but does not disclose a negative voltage level being applied to the second region.

Rhodes discloses (see figs. 4-7 and par. 0051) an image sensor comprising a semiconductor substrate 310; a peripheral circuit 320 formed on a first region; a unit pixel array

315 having a plurality of unit pixels formed on a second region of a semiconductor substrate wherein a negative voltage level Vbb is applied to the second region; and a negative voltage circuit 90 configured to provide the negative voltage for the second region.

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to incorporate Rhodes' teachings with Sawada's device since that would prevent charge leakage as taught by Rhodes.

As for claim 2, Sawada discloses an image sensor comprising a semiconductor substrate; and buried layer 15/11 surrounding unit pixels.

5. Claims 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sawada et al. ("Sawada") in view of Rhodes as applied to claims 1 and 2 above, and further in view of Tredwell et al. ("Tredwell") USPN 5,859,462.

The combined references disclose the device structure as recited in the claim including a buried layer 11 formed in an epitaxial layer 12, but do not disclose a p+-type substrate and a p-type epitaxial layer formed on the substrate.

Tredwell discloses in figs. 3, 9 and 10 an image sensor comprising a semiconductor substrate 23 or a p-type substrate and a p-type epitaxial layer 26 formed on the substrate, wherein a buried layer 20 being formed in the p-type epitaxial layer.

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to incorporate Tredwell's teachings with since that would provide a lowered cross-talk as taught by Tredwell.

6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sawada et al. ("Sawada") USPN 6,184,516 in view of Rhodes US PG-Pub 2003/0169360.

Sawada discloses in figs. 1-6 an image sensor comprising a plurality of pixels 20/80 in a first region of a substrate at a ground reference GND, each pixel surrounded by a first epitaxial layer that is biased at a negative potential relative to the ground reference, but do not specifically disclose a bias generator.

Rhodes discloses (see figs. 4-7 and par. 0051) an image sensor comprising a semiconductor substrate 310; a plurality of unit pixels 325 formed in a first region of a substrate; and a bias generator Vbb formed in a second region 330.

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to incorporate Rhodes' teachings with Sawada's device since that would lower leakage as taught by Rhodes.

7. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rhodes US PG-Pub 2003/0169360 in view of Sawada et al. ("Sawada") USPN 6,184,516.

Rhodes discloses (see figs. 4-7 and par. 0051) a method for improving the charge transfer of a photodiode device, the method comprising the steps providing a bias generator in a first region; providing a photodiode device in a second region formed in the substrate including spacing apart the first region from the second region and isolating the second region from the first region, the photodiode device having a photodiode including a p-type side that is electrically couple to the negative potential, but does not disclose a ground reference in a first region formed in a substrate.

Sawada discloses in figs. 1-6 a method for improving the charge transfer of a photodiode device, the method comprising the steps providing a ground reference in a first region formed in a substrate.

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to incorporate Sawada's teachings with Rhodes' device since that would provide a wide dynamic range as taught by Sawada.

Allowable Subject Matter

8. Claims 4 and 5 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to A. Sefer whose telephone number is (571) 272-1921.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (571) 272-1915. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571) 272-2800.

ANS
March 14, 2004

NATHAN J. FLYNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800